

## GALILEO INFRARED OBSERVATIONS OF THE SHOEMAKER-LEVY 9 G AND R FIREBALLS AND SPLASH

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The Galileo spacecraft was fortuitously situated for a direct view of the impacts of comet Shoemaker-Levy 9 in Jupiters atmosphere and measurements were recorded by the Near Infrared Mapping Spectrometer (NIMS) instrument for several of the impact events. Seventeen discrete wavelength channels were used between 0.7 to 5.0 microns, obtained with a time resolution of 5 seconds. Two phases of the impact phenomena are found in the data: the initial fireball, which was evident for one minute, and subsequent fallback of impact ejects onto the atmosphere, starting six minutes after fireball initiation.

Preliminary analysis of the G event data shows a fireball appearing at 07:33:37 UT (as would be observed from the Earth) with a temperature of 4000 K or greater and an effective source diameter of 20 km or less. These spectra show absorption by methane and molecular hydrogen whose strength place the fireball in the upper troposphere, above the ammonia clouds. As time progresses, the fireball cools and the effective diameter increases about 2 km/sec. The strength of the hydrogen and methane absorption decreases with time, indicating that the radiating surface is rising supersonically. The fireball appears to expand adiabatically, with an adiabatic index of 1.2. After about 30 seconds, the spectra indicate a multiple temperature or opacity structure.

A second phase of strong IR emission for the G event. was detected beginning at 07:39:41 UT, which we interpret as impact ejects, supersonically ejected in the fireball and plume, falling back upon the atmosphere. The resulting infrared emission steadily brightened over 2 minutes following its first detection. The timing of the event implies a minimum ejection velocity of 4 km/sec. Spectra of this splash phase suggest O-H and C-H stretch emission, perhaps from shock heated water vapor and methane.

The R impact data show qualitatively similar behavior, but with intensities reduced by a factor of two to four.